J Raptor Res. 33(3):248–251

Nesting Ecology of Red-shouldered and Red-tailed Hawks in Georgia

Christopher E. Moorman[1]
Daniel B. Warnell School of Forest Resources, University of Georgia, Athens, GA 30602-2152 U.S.A.

Doug L. Howell
PWBC, AFZA-PW-EW, Wildlife Branch, Fort Bragg, NC 28307-5000 U.S.A.

Brian R. Chapman
Daniel B. Warnell School of Forest Resources, University of Georgia, Athens, GA 30602-2152 U.S.A.

Key Words: *Red-shouldered Hawk; Red-tailed Hawk;* Buteo lineatus; Buteo jamaicensis; *reproductive success; nest-site reoccupancy; nesting chronology.*

Because forest raptors occupy the top of many food chains, have relatively large home ranges and have a history of human persecution, they generally are among the first groups of vertebrates to respond to alterations of habitat (Fuller 1996, Niemi and Hanowski 1997). Therefore, information on the biology and nesting ecology of forest raptors is needed to predict or mitigate possible impacts of habitat alterations associated with forest management practices. This is especially true in the southeastern U.S., where large areas are under intensive timber management and little is known about the regional biology of resident raptor species.

Although Breeding Bird Surveys indicate that resident populations of Red-shouldered (*Buteo lineatus*) and Red-tailed (*B. jamaicensis*) Hawks are stable or increasing in Georgia (Preston and Beane 1993, Crocoll 1994), little has been published concerning their nesting ecology in the southeastern U.S. Moorman and Chapman (1996) compared the macro- and micro-habitat factors that influence nest-site selection of the two species, and Howell and Chapman (1997) described the home range and habitat use of nesting Red-shouldered Hawks in central Georgia. Here, we present data on the nesting chronology, nesting success and nest reoccupancy rates for both species in Georgia.

Study Area and Methods

Our study was conducted in 1994 and 1995 at the Bishop F. Grant Memorial Forest (BGMF), a 5718-ha state wildlife management area located in Putnam County, Georgia. The BGMF contains a diversity of habitat types including bottomland and upland hardwoods, various-aged pine stands and pastures (Moorman and Chapman 1996, Howell and Chapman 1997).

We searched for old hawk nests between January and early March 1994, and returned beginning in mid-March to check for signs of nesting activity. We continued to search for occupied nests through mid-June 1994. We located hawk nests by searching areas where they were seen perching or soaring. To prevent bias, nest searches also were conducted in all forested stands with trees >20 yr old where birds were not seen or heard. Nests were considered occupied if incubating females down or young were observed in nests. Young could not be documented during ground visits until they were approximately 1 wk old. We monitored occupied nests of both species every 7–10 d and recorded the status (e.g., incubating, small young, large young). A nest was considered successful if it fledged at least one young. Actual fledging dates were calculated as the median day between the last visit when young were present in nests and the visit when nests were vacant. Because nests were found throughout the breeding season, data from the early portion of the nesting season was lacking for some pairs. Return visits were made during 1995 to check activity of 1994 nests and to make observations on hawk nesting ecology. Nest revisits began on 31 March 1995 and were continued every 10 d until the end of June.

Results

Red-shouldered Hawk Nesting Ecology. Twelve Red-shouldered Hawk nests were found in 1994. Incubation was first observed on 24 March and it continued through 18 May at one nest. Nestlings were first observed on 25 April and most nests contained young by 7 May. Fledgling hawks were first observed on 5 June and all successful nests had fledged young by 25 June. Four nests failed to fledge young, two nests fledged one young and six nests fledged two young.

In 1995, we revisited 10 Red-shouldered Hawk nests used in 1994. The two other nests from 1994 either had been damaged or had fallen from trees at the end of the 1994 breeding season so they were not revisited in 1995. We located occupied nests in six of the 10 nesting territories used the previous year. Two pairs repaired and used alternate nests within the same breeding territory occupied in 1994, and four others reused 1994 nests. Three female hawks were banded and radio-collared in 1994 (Howell and Chapman 1997). In 1995, banded birds were seen entering or leaving nests in all three ter-

[1] Present address: Extension Forestry, North Carolina State University, Box 8003, Raleigh, NC 27695-8003 U.S.A.

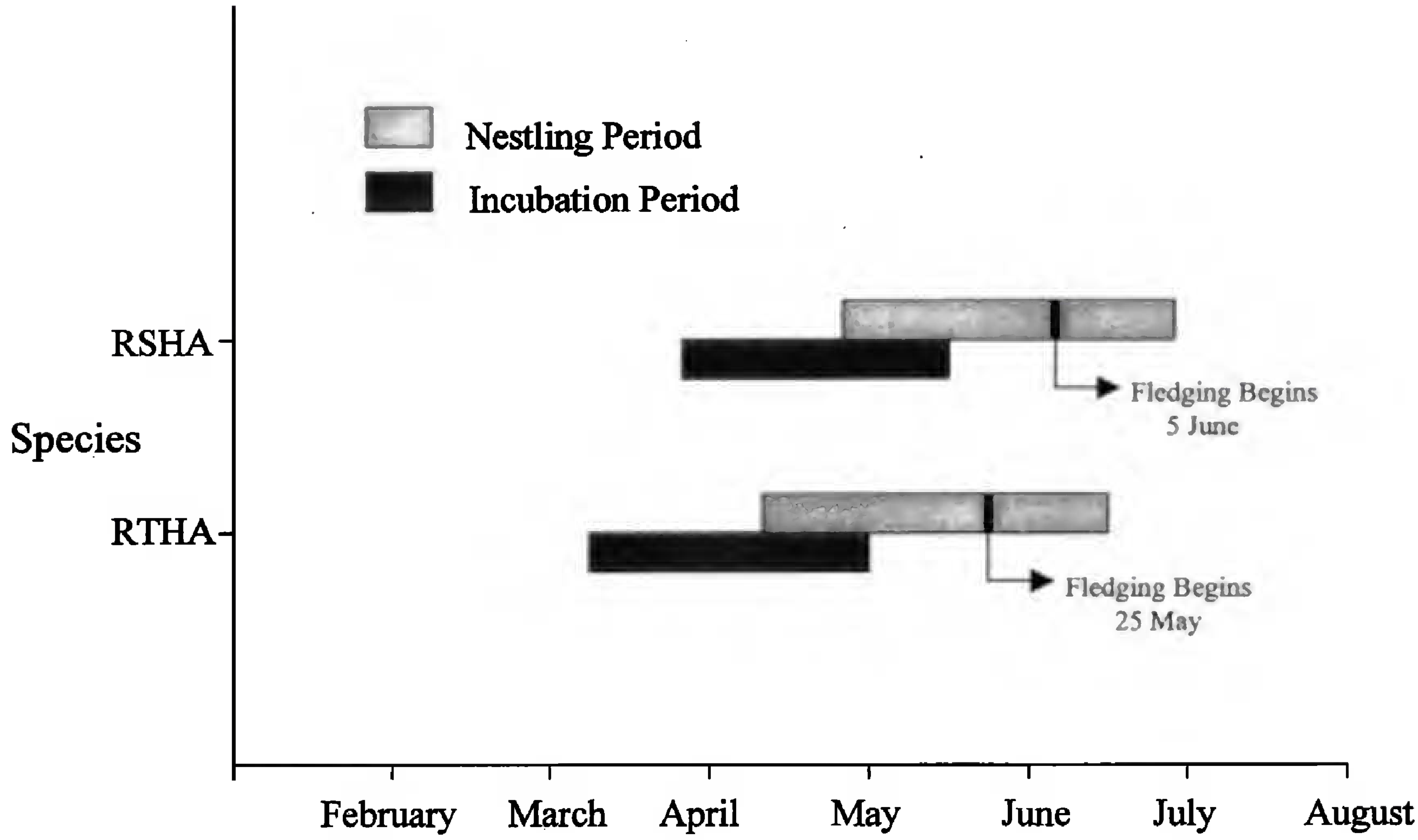

Figure 1. Nesting chronology of Red-shouldered (RSHA) and Red-tailed Hawks (RTHA) in Georgia.

ritories in which females were marked during the previous season, indicating that the same females reoccupied nests used in 1994. Nesting activity in 1995 was first observed on 6 April. Red-shouldered Hawk young were first observed on 18 April and all nests contained nestlings by 12 May. All Red-shouldered Hawk young fledged by 25 June. One nest failed, four nests fledged two young and one fledged three young.

Red-tailed Hawk Nesting Ecology. Ten Red-tailed Hawk nests were located during the 1994 breeding season. Signs of incubation were first observed on 7 April but, because we failed to locate most Red-tailed Hawk nests early in the nesting season, incubation probably started earlier. Nestlings were first observed on 15 May and an unfledged nestling was last observed in a nest on 15 June. Fledglings were first observed on 14 June and most remained near the nest for several more weeks. Five of 10 Red-tailed Hawk nests fledged one young. Remains of dead nestlings were found under two of the nests that fledged young.

Eight Red-tailed Hawk nests used in 1994 were revisited in 1995. The two other nests from 1994 were not revisited for logistical reasons. Six of eight 1994 Red-tailed Hawk nests were reoccupied. One nest occupied by Great Horned Owls (*Bubo virginianus*) in March 1995 was not used, although a pair of Red-tailed Hawks was observed repeatedly in the area during later visits that year. During our initial visit on 31 March 1995, signs of incubation were observed at four of the nests used in 1994. Red-tailed Hawk nestlings were first observed on 12 May. Several of these nestlings were well developed and appeared to be approximately 2 weeks old. Fledgling Red-tailed Hawks were first observed on 6 June. Three of six nests fledged one young, two fledged two young and one nest failed.

DISCUSSION

Nesting chronology for both hawk species in Georgia likely varies by individual pair and year. However, on average, Red-shouldered Hawks begin incubation in late March, eggs hatch in late April to early May, and young fledge in early to mid-June (Fig. 1). Red-tailed Hawk nesting generally begins 2 wk earlier (Fig. 1). Burleigh (1958) reported incubation by a Red-shouldered Hawk as early as 22 March and as late as 1 May, and incubation by a Red-tailed Hawk as early as 15 February and as late as 10 April in Georgia. We documented later incubation dates for both species, although the birds observed incubating in our study might have been brooding small nestlings.

Red-shouldered Hawks often fledge up to four young, but the average number/breeding pair usually ranges from 1.1–1.8 (Crocoll 1994). Red-tailed Hawk nest success ranges from 58–93%, but the number of young fledged/breeding pair is usually between 1.0–1.5 (Preston and Beane 1993). During the 1994 breeding season, Red-shouldered Hawk nesting success (66%) and number of fledglings/breeding pair (1.17) were similar to that of previous studies, but Red-tailed Hawk nest success (50%) and number of fledglings/breeding pair (0.5) were lower than reports from other parts of North America. Red-tailed Hawk clutch sizes generally increase from south to north and from east to west (Henny and Wight 1972, Preston and Beane 1993), so the low productivity may not be unusual for the southeastern U.S. These low numbers also may suggest that prey abundance was low during the first year of our study (Preston and Beane 1993), but data on prey abundance were unavailable. Two dead young were found below Red-tailed Hawk nests in 1994, which may indicate nestling starvation or sibling aggression (Stinson 1980). Records from our return visits in 1995 indicated that nest success (83% and 83%) and number of fledglings/breeding pair (1.83 and 1.17) increased for both Red-shouldered and Red-tailed Hawks, respectively. However, our 1995 results could be biased because early nest failures or pairs in new territories were not monitored.

Breeding-site fidelity is common in both species (Bent 1937, Preston and Beane 1993, Crocoll 1994). In Wisconsin, Jacobs and Jacobs (1993) documented 50% nest reoccupancy and 83% territory reoccupancy by Red-shouldered Hawks. Burleigh (1958) reported one incident of traditional nest-site use by Red-shouldered Hawks and one account of nest-site reoccupancy by the Red-tailed Hawk in Georgia. However, nest-site reoccupancy rates have not been reported for the two hawk species in the southeastern U.S. Forty percent of the Red-shouldered Hawk nests used in 1994 were reoccupied in 1995, and Red-shouldered Hawks occupied alternate nests in at least two more of the 10 territories used in 1994 (≥60% territory reoccupancy). Seventy-five percent of the nests used in 1994 by Red-tailed Hawk pairs were reoccupied in 1995. We could not measure fidelity because hawks were not uniquely marked, but the presence of banded female Red-shouldered Hawks indicated that the same females returned to the nesting territories occupied the previous year.

Red-tailed Hawk breeding territories associated with ephemeral, early-successional habitats such as clearcuts may shift with changes in the vegetative structure of these stands. However, nests located near permanent openings such as pastures may be reoccupied for many consecutive years. Red-shouldered Hawks, which nest in mature, more permanent bottomland forests (Bednarz and Dinsmore 1981, Moorman and Chapman 1996), likely also maintain traditional territory boundaries for long periods. Conservation of areas containing traditional Red-shouldered Hawk breeding territories may help prevent replacement by Red-tailed Hawks (Bednarz and Dinsmore 1982).

RESUMEN.—La ecología de anidación de *Buteo lineatus* y *Buteo jamaicensis* ha sido poco conocida en el sureste de los Estados Unidos. Documentamos la cronología de anidación, éxito de anidación y reocupación de nidos para ambas especies entre 1994–95. Durante la época reproductiva de 1994, el éxito de anidación (66%) de *Buteo lineatus* y de productividad (1.17 pichones/pareja reproductiva) fué muy inferior a los valores reportados anteriormente. Las nuevas visitas a los nidos y las observaciones adicionales en 1995, indicaron que el éxito reproductivo incrementó para las dos especies. Los cambios en el éxito reproductivo de las dos especies pudo haber sido causado por fluctuaciones en las poblaciones de presas. Las tasas de re-ocupación de nidos fueron del 75% y 40% para *Buteo jamaicensis* y *Buteo lineatus* respectivamente. La conservación de las áreas tradicionales de anidación puede ser requerida para mantener las poblaciones locales de gavilanes en reproducción.

[Traducción de César Márquez]

ACKNOWLEDGMENTS

We thank J.H. Brunjes, C.W. Eberly and C. Howell. This manuscript was improved by comments provided by D.S. Mizrahi, S.M. Lohr, and K.R. Russell. Funding was provided by the Daniel B. Warnell School of Forest Resources at the University of Georgia and McIntire Stennis Project No. GEO-0074-MS.

LITERATURE CITED

BEDNARZ, J.C. AND J.J. DINSMORE. 1981. Status, habitat use, and management of Red-shouldered Hawks in Iowa. *J. Wild. Manage.* 45:236–241.

——— AND ———. 1982. Nest-sites and habitat of Red-shouldered and Red-tailed Hawks in Iowa. *Wilson Bull* 94:31–45.

BENT, A.C. 1937. Life histories of North American birds of prey. Pt. 1. U.S. Natl. Mus. Bull. 167, Washington, DC U.S.A.

BURLEIGH, T.D. 1958. Georgia birds. Univ. Oklahoma Press, Norman, OK U.S.A.

CROCOLL, S.T. 1994. Red-shouldered Hawk (*Buteo lineatus*). *In* A. Poole and F. Gill [EDS.], The birds of North America, No. 107. The Philadelphia Academy of Natural Sciences, Philadelphia, PA U.S.A. and American Ornithologists' Union, Washington, DC U.S.A.

FULLER, M.R. 1996. Forest raptor population trends in North America. Pages 167–208 *in* R. DeGraaf and R.I Miller [EDS.], Conservation of faunal diversity in forested landscapes. Chapman-Hall, London, U.K.

HENNY, C.J. AND H.M. WIGHT. 1972. Population ecology and environmental pollution: Red-tailed and Cooper's Hawks. Pages 229–250 *in* Population ecology of migratory birds: a symposium. U.S. Dept. Int. Wildlf Res. Rep. 2, Washington, DC U.S.A.

HOWELL, D.L. AND B.R. CHAPMAN. 1997. Home range and habitat use of Red-shouldered Hawks (*Buteo lineatus*) in Georgia. *Wilson Bull.* 109:131–144.

JACOBS, J. AND E. JACOBS. 1993. Summary of Red-shouldered Hawk reproduction in northeastern and central Wisconsin. Wisconsin Dept. Natural Resources, Bureau of Endangered Resources, Madison, WI U.S.A.

MOORMAN, C.E. AND B.R. CHAPMAN. 1996. Nest-site selection of Red-shouldered and Red-tailed Hawks in a managed forest. *Wilson Bull.* 108:357–368.

NIEMI, G.J. AND J.M. HANOWSKI. 1997. Preface raptor responses to forest management: a Holarctic perspective. *J. Raptor Res.* 31:93–94.

PRESTON, C.R. AND R.D. BEANE. 1993. Red-tailed Hawk (*Buteo jamaicensis*). *In* A. Poole and F. Gill [EDS.], The birds of North America, No. 52. The Philadelphia Academy of Natural Sciences, Philadelphia, PA U.S.A. and American Ornithologists' Union, Washington, DC U.S.A.

STINSON, C.H. 1980. Weather-dependent foraging success and sibling aggression in Red-tailed Hawks in central Washington. *Condor* 82:76–80.

Received 9 September 1998; accepted 13 March 1999

J. Raptor Res. 33(3):251–254

THE RED KITE (*MILVUS MILVUS*) REINTRODUCTION PROJECT: MODELING THE IMPACT OF TRANSLOCATING KITE YOUNG WITHIN ENGLAND

IAN CARTER, MICK MCQUAID, NIGEL SNELL AND PETER STEVENS
English Nature, Northminster House, Peterborough PE1 1UA, U.K.

KEY WORDS: *Red Kite;* Milvus milvus; *reintroduction; translocations; England.*

The Red Kite (*Milvus milvus*) reintroduction project started in 1989 with the release of six Swedish kites at a site in northern Scotland and four Swedish and one Welsh kite at a site in southern England (Evans et al. 1991). From 1989–94, a total of 93 birds were released at each site with southern England birds coming mainly from Spain and northern Scotland birds from Sweden (Evans et al. 1997). As a result of these releases, small populations have been successfully established in both release areas. In 1997, the southern England breeding population reached about 55 pairs and is now considered to be self-sustaining.

In order to improve the status of Red Kites in Britain and to increase their spread to other suitable areas, releases have started at two new sites in central Scotland and the English midlands (Carter 1995). At the latter site, a total of 29 birds, mainly from Spain, were released in 1995 and 1996. In 1997, another 10 kites from Spain were released but, due to concerns about declines in the Red Kite population in parts of Spain, Spanish authorities decided that it would be difficult for them to supply kites for the project in future years. Discussions with the recently formed Welsh Kite Trust led to an agreement that young rescued from vulnerable nests and for which suitable foster nests could not be found within Wales would be made available for translocation to the English midlands release site. However, this would involve only a few birds and, in some years, no young would be available for the reintroduction project.

In order to make up this short-fall of birds for release, the translocation of young kites from the expanding southern England population was considered. To help assess the impact of any such translocations, we devised a simple model to show the likely effects on the southern England and midlands populations. Various scenarios were modeled, reflecting the range of options available.

METHODS

The model used the following data and assumptions based mainly on monitoring work on the expanding southern England kite population up to 1996 (Evans et al. 1997, N. Snell, M. McQuaid and P. Stevens unpubl. data): (1) 76% survival in the first year based on sightings of individually-identifiable, wing-tagged kites, released between 1989–94 ($N = 93$); (2) 93.5% adult survival based on sightings of individually-identifiable, wing-tagged kites in their second and subsequent years ($N = 136$); (3) breeding productivity of 2.1 young per breeding attempt between 1991–96 ($N = 94$); (4) balanced immigration and emigration (this seemed reasonable because Red Kites are known to have a very high level of natal philopatry [Newton et al. 1994]. No wing-tagged kites released or fledged in southern England have yet been found breeding elsewhere, although because some released birds have now lost their tags and not all young are fitted with tags each year, it is possible that a small number of cases have gone undetected; at least one continental immigrant is known to have been recruited into the southern England breeding population [I. Evans pers comm.]); (5) age of first breeding at two years (in the southern England population, kites have occasionally bred in their first year but normally attempt to breed for the first time in their second year; in Wales where the habitat is less suitable, kites have been recorded breeding